CLAIMS

What is claimed is:

1. A method for fine granular scalability encoding, comprising the steps of:

(a) repeating, for each individual transform block in an image frame, the steps of:

(i) decomposing a respective plurality of residual coefficients for the respective transform block;

(ii) processing a respective plurality of bit-planes or discrete quantization steps for the respective transform block before decomposing coefficients for a next one of the transform blocks in the image frame.

2. The method of claim 1, wherein the transform blocks are discrete cosine transform (DCT) blocks, and the residual coefficients are DCT residual coefficients.

3. The method of claim 2, wherein step (ii) includes run-length and variable length coding each of the plurality of bit-planes .

4. The method of claim 2, wherein step (a) further comprises

(iii) storing each bit-plane at a respectively different position.

5. The method of claim 4, wherein each b^{th} bit-plane of the i^{th} one of the DCT blocks is stored in a location immediately following the location of the b^{th} bit-plane of the $i\text{-}1^{th}$ one of the DCT blocks, where b is an integer, and i is an integer greater than one.

6. The method of claim 2, further comprising:

(b) forming a compressed bitstream containing the respective plurality of bit-planes for all of the DCT blocks in the image frame, wherein the data in the compressed bitstream are arranged by bit-plane.

7. The method of claim 6, wherein:

step (a) further comprises determining a maximum magnitude of any DCT coefficient for the respective DCT block;

the method further comprises determining a maximum one of the maximum magnitudes before step (b); and

the data from the plurality of bit-planes are arranged in the compressed bitstream beginning with the bit-plane corresponding to the maximum one of the maximum magnitudes.

8. The method of claim 6, wherein steps (a) and (b) are performed without requiring simultaneous storage of all the DCT residual coefficients for the image frame.

9. The method of claim 1, wherein the plurality of bit-planes includes each bit-plane from a most significant bit-plane to a least signficant bit-plane .

10. The method of claim 1, wherein the transform blocks are formed by one of the group consisting of discrete cosine transform, block-based wavelet coding or matching pursuit and SNR-scalabilities using discrete quantization steps.

11. Apparatus for fine granular scalability encoding, comprising

means for decomposing a plurality of residual coefficients for an individual transform block of /an image frame;

scanning and coding means for processing a respective plurality of bit-planes or discrete quantization steps for the respective transform block before decomposing coefficients for a next one of the transform blocks in the image frame.

12. The apparatus of claim 11, wherein the scanning and coding means include means for scanning blocks in a first sequence and for storing coded data in a second sequence different from the first sequence.

13. The apparatus of claim 12, wherein:

the transform blocks are discrete cosine transform (DCT) blocks, and the residual coefficients are DCT residual coefficients; and

each b^{th} bit-plane of the i^{th} one of the DCT blocks is stored in a location immediately following the location of the b^{th} bit-plane of the $i\text{-}1^{th}$ one of the DCT blocks, where b is an integer, and i is an integer greater than one.

14. The apparatus of claim 11, wherein the apparatus does not have a memory used for simultaneous storage of all the DCT residual coefficients for the image frame.

15. The apparatus of claim 11, wherein the decomposing means provides residual coefficient data for a block directly to the scanning and coding means without storing the residual coefficient data in an intermediate storage device.

16. The apparatus of claim 11, wherein the decomposing means provides residual coefficient data for a block directly to the scanning and coding means without masking the residual coefficient data to extract data for a single bit-plane from all of the blocks in the image frame.

17. A computer readable medium having computer program code encoded thereon, wherein, when the computer program code is executed by a processor, the processor executes a method for fine granular scalability encoding, comprising the steps of:

(a) repeating , for each individual transform block in an image frame, the steps of:

(i) decomposing a respective plurality of residual coefficients for the respective transform block;

(ii) processing a respective plurality of bit-planes or discrete quantization steps for the respective transform block before decomposing coefficients for a next one of the transform blocks in the image frame.

18. The computer readable medium of claim 17, wherein the transform blocks are discrete cosine transform (DCT) blocks, and the residual coefficients are DCT residual coefficients.

19. The computer readable medium of claim 18, wherein step (ii) includes run-length and variable length coding each of the plurality of bit-planes.

20. The computer readable medium of claim 18, wherein

step (a) further comprises storing each bit-plane at a respectively different position; and

each b^{th} bit-plane of the i^{th} one of the DCT blocks is stored in a location immediately following the location of the b^{th} bit-plane of the $i\text{-}1^{th}$ one of the DCT blocks, where b is an integer, and i is an integer greater than one.